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Impact of Meteorological Factors on Influenza Activity in Pakistan; A Tale of Two Cities

Authors : Nadia Nisar

Abstract : Background: In the temperate regions Influenza activities occur sporadically all year round with peaks coinciding during cold months. Meteorological and environmental conditions play significant role in the transmission of influenza globally. In this study, we assessed the relationship between meteorological parameters and influenza activity in two geographical areas of Pakistan. Methods: Influenza data were collected from Islamabad (north) and Multan (south) regions of national influenza surveillance system during 2010-2015. Meteorological database was obtained from National Climatic Data Center (Pakistan). Logistic regression model with a stepwise approach was used to explore the relationship between meteorological parameters with influenza peaks. In statistical model, we used the weekly proportion of laboratory-confirmed influenza positive samples to represent Influenza activity with metrological parameters as the covariates (temperature, humidity and precipitation). We also evaluate the link between environmental conditions associated with seasonal influenza epidemics: 'cold-dry' and 'humid-rainy'. Results: We found that temperature and humidity was positively associated with influenza in north and south both locations (OR = 0.927 (0.88-0.97)) & (OR = 0.1.078 (1.027-1.132)) and (OR = 1.023 (1.008-1.037)) & (OR = 0.978 (0.964-0.992)) respectively, whilst precipitation was negatively associated with influenza (OR = 1.054 (1.039-1.070)) & (OR = 0.949 (0.935-0.963)). In both regions, temperature and humidity had the highest contribution to the model as compared to the precipitation. We revealed that the p-value for all of climate parameters is <0.05 by Independent-sample t-test. These results demonstrate that there were significant relationships between climate factors and influenza infection with correlation coefficients: 0.52-0.90. The total contribution of these three climatic variables accounted for 89.04%. The reported number of influenza cases increased sharply during the cold-dry season (i.e., winter) when humidity and temperature are at minimal levels. Conclusion: Our findings showed that measures of temperature, humidity and cold-dry season (winter) can be used as indicators to forecast influenza infections. Therefore integrating meteorological parameters for influenza forecasting in the surveillance system may benefit the public health efforts in reducing the burden of seasonal influenza. More studies are necessary to understand the role of these parameters in the viral transmission and host susceptibility process.

Keywords : influenza, climate, metrological, environmental
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